

AMENDMENTS TO THE CLAIMS

1-19. (Canceled)

20. (Currently amended) A process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of at least 2 $\mu\text{m}/\text{min}$, said process comprising:

(a) providing a plating bath comprising:

- (1) Cu^{2+} ;
- (2) H_2SO_4 ;
- (3) Cl^- ;
- (4) a brightener;
- (5) a wetting agent; and
- (6) water;

(b) providing a microelectronic workpiece having one or more than one through-mask openings opening with a conductive layer at the bottom of said opening;

(c) contacting said conductive layer with said plating bath;

(d) providing electroplating power between said conductive layer and an anode disposed in electrical contact with said bath; and

(e) depositing copper onto said conductive layer at a rate of at least 2 $\mu\text{m}/\text{min}$ to form a feature in each of the more than one through-mask openings, wherein thickness variation of the features is less than 10% with a standard deviation of 3.

21. (Original) The process of Claim 20, wherein the current density of said electroplating power is 100-300 mA/cm^2 .

22. (Original) The process of Claim 21, wherein the current density of said electroplating power is 150-220 mA/cm².

23. (Original) The process of Claim 20, wherein the waveform of said electroplating power is a DC and a pulse with a 10-50% duty cycle at 50-1000 Hz.

24. (Original) The process of Claim 20, wherein said workpiece is rotated at a speed of 20-200 revolutions per minute and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute.

25. (Original) The process of Claim 20, wherein said bath has a temperature of 25-35°C.

26. (Original) The process of Claim 20, wherein the depositing step further comprising depositing copper to form a deposited feature having a smooth surface morphology.

27. (Original) The process of Claim 20, wherein the depositing step further comprising depositing copper to form a deposited feature that has a substantially flat surface.

28. (Canceled)

29. (Currently amended) A process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate of at least 2 µm/min, said process comprising:

- (a) providing a plating bath comprising:
 - (1) Cu²⁺;
 - (2) H₂SO₄;
 - (3) Cl⁻;

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- (4) a brightener;
- (5) a wetting agent;
- (6) a leveler; and
- (7) water;

(b) providing a microelectronic workpiece having one or more than one through-mask openings opening with a conductive layer at the bottom of said opening;

- (c) contacting said conductive layer with said plating bath;
- (d) providing electroplating power between said conductive layer and an anode disposed in electrical contact with said bath; and

(e) depositing copper onto said conductive layer at a rate of at least 2 $\mu\text{m}/\text{min}$ to form a feature in each of the more than one through-mask openings, wherein thickness variation of the features is less than 10% with a standard deviation of 3.

30. (Original) The process of Claim 29 wherein the current density of said electroplating power is 100-300 mA/cm².

31. (Original) The process of Claim 30 wherein the current density of said electroplating power is 150-220 mA/cm².

32. (Original) The process of Claim 29 wherein the waveform of said electroplating power is a DC and a pulse with a 10-50% duty cycle at 50-1000 Hz.

33. (Original) The process of Claim 29 wherein said workpiece is rotated at a speed of 20-200 revolutions per minute and wherein said bath flows against said workpiece at a flow rate of 1-10 gallons per minute.

34. (Original) The process of Claim 29 wherein said bath has a temperature of 25-35°C.

35. (Original) The process of Claim 30, wherein the depositing step further comprising depositing copper to form a deposited feature having a smooth surface morphology.

36. (Original) The process of Claim 30, wherein the depositing step further comprising depositing copper to form a deposited feature that has a substantially flat surface.

37-43. (Canceled)

44. (Currently amended) A process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate in the range of about 4 $\mu\text{m}/\text{min}$ to about 6 $\mu\text{m}/\text{min}$, said process comprising:

(a) providing a plating bath comprising:

- (1) Cu^{2+} ;
- (2) H_2SO_4 ;
- (3) Cl^- ;
- (4) a brightener;
- (5) a wetting agent; and
- (6) water;

(b) providing a microelectronic workpiece having one or more than one through-mask openings opening with a conductive layer at the bottom of said opening;

(c) contacting said conductive layer with said plating bath;

(d) providing electroplating power between said conductive layer and an anode disposed in electrical contact with said bath; and

(e) depositing copper onto said conductive layer at a rate in the range of about 4 $\mu\text{m}/\text{min}$ to about 6 $\mu\text{m}/\text{min}$ to form a feature in each of the more than one through-mask openings, wherein thickness variation of the features is less than 10% with a standard deviation of 3.

45. (Currently amended) A process for electroplating copper on a microelectronic workpiece in a through-mask plating application at a rate in the range of about 4 $\mu\text{m}/\text{min}$ to about 6 $\mu\text{m}/\text{min}$, said process comprising:

(a) providing a plating bath comprising:

- (1) Cu^{2+} ;
- (2) H_2SO_4 ;
- (3) Cl^- ;
- (4) a brightener;
- (5) a wetting agent;
- (6) a leveler; and
- (7) water;

(b) providing a microelectronic workpiece having one or more than one through-mask openings opening with a conductive layer at the bottom of said opening;

(c) contacting said conductive layer with said plating bath;

(d) providing electroplating power between said conductive layer and an anode disposed in electrical contact with said bath; and

(e) depositing copper onto said conductive layer at a rate in the range of about 4 $\mu\text{m}/\text{min}$ to about 6 $\mu\text{m}/\text{min}$ to form a feature in each of the more than one through-mask openings, wherein thickness variation of the features is less than 10% with a standard deviation of 3.